

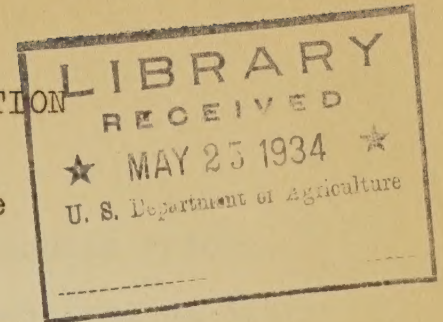
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EX61P

ANIMAL HUSBANDRY DIVISION
HAWAII AGRICULTURAL EXPERIMENT STATION
HONOLULU, HAWAII

Under the joint supervision of the
UNIVERSITY OF HAWAII
and the
UNITED STATES DEPARTMENT OF AGRICULTURE



Progress Notes on Experiments and Other Items of Interest

No. 4

January, 1934

These progress notes on experimental work and other items of interest to livestock men in the Territory are issued from time to time by the Animal Husbandry Division. You are invited to suggest other lines of research that you deem important and to submit inquiries to the University.

GREEN PIGEON PEA TOPS WITH ATTACHED PODS VS. GREEN
ALFALFA FOR DAIRY COWS

Introduction

The pigeon pea introduced to Hawaii by Professor Krauss about 1906 has been widely grown in this Territory and while it has been somewhat used as a feed for dairy cows, its major use in the past has been as a pasture crop for beef cattle and for improving worn out soils by increasing their nitrogen and organic matter content.

Krauss reports an experiment at Haiku, Maui where ten Jersey cows on pigeon pea products, including pasturage, hay and milled feeds, yielded 8 per cent more milk than when fed the best imported feeds, resulting in a big saving in the cost of milk production. These promising results suggested the desirability of further work in this field which is reported in this paper.

Early Experiment at University Farm

In the summer of 1923 five Holstein cows previously heavily fed with green roughages and imported concentrates were put on an acre of

pigeon peas (field B - 2) that had been planted 20 months before. During the time they were on the pigeon peas they received no other roughages or concentrates.

In order to readily make comparisons, production for a previous period of the same length as when they were on the pigeon peas was assumed to be 100 per cent and their production during the time they were on the pigeon peas is reported as the percentage production of the previous period of equal length when regular roughages and concentrates were fed.

Cow No.	'Actual 'previous 'production'	'Percentage 'production on 'regular feeds'	'Days on 'pigeon peas'	'Percentage 'production on 'pigeon peas'
2	'32.7 lbs.'	100	' 10	' 61
11	'35.6 lbs.'	100	' 10	' 89
25	'15.0 lbs.'	100	' 21	' 90
26	'16.5 lbs.'	100	' 48	' 73
36	'16.2 lbs.'	100	' 27	' 79

While some of the cows above maintained their production fairly well, the rate of decline is materially faster than would be expected in a normal lactation, suggesting the desirability of additional feeds. Unfortunately no record was made as to the amount of podding in the pigeon pea field at the time the cows were pastured, and the presence or absence of partially matured pods would have been a big factor in the amount of milk produced.

Later Experiments*

Two recent experiments were conducted for the purpose of comparing green pigeon pea tops with attached (largely immature) pods with green alfalfa when used as the sole roughages for dairy cows. In these experiments the roughages were cut and fed to the cattle in feed racks which enabled us to keep a definite record of the amount of roughage consumed. They were given as much of each roughage as they would consume. Unconsumed roughages were weighed back.

Six cows were used in each test and each test was conducted for twelve weeks. The period of the first test was February 18 to May 11, 1932; the second October 13, 1932 to January 4, 1933.

In each test the six cows were divided into two lots of three each. In dividing the cows, production, date of freshening, date due to calve, weight etc., were considered thus making the two lots in each test as equal as possible.

The reversal system of feeding was followed. Lot A was started on pigeon pea tops and after four weeks was shifted to green alfalfa roughage, and after another four weeks was again shifted back to the pigeon pea tops for the last four weeks of the twelve week test. Lot B was started on green alfalfa, given pigeon peas the second or middle period, and green alfalfa the last four weeks of the test. The last three weeks of each four week period were used in computing results. The mean of the first and last periods of each lot was compared with the second or middle period in order to compensate for the decreasing production due to advancing lactation.

* The writer wishes to acknowledge the valuable help of G.W.H. Goo in computing results of these experiments.

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Both lots of cows in each test were placed in small pastures, 36 x 200 feet in which the roughages were fed in racks. Many of the coarser branches of the pigeon pea tops were not consumed but these as well as unconsumed alfalfa was weighed back and the weights reported later are for roughages actually consumed.

All the cows received the same mixture of grain and beet pulp, and while the quantities fed to different cows varied depending on their production, the average of the grain fed each individual cow during the first and last period was the same as that fed the middle period. Since in these experiments we were trying to determine the value of roughages it was obviously necessary not to vary the quality or quantity of the concentrates.

Concentrate Feed Mixture Used

		<u>Digestible</u>	
		<u>Protein</u>	<u>Total Nutrients</u>
75 lbs.	Rolled Barley.....	6.75 lbs.	59.55 lbs.
50 lbs.	Corn Meal.....	3.75 "	42.85 "
100 lbs.	Wheat Bran.....	12.50 "	60.90 "
10 lbs.	Coconut Oil Cake Meal...	1.99 "	7.08 "
5 lbs.	Linseed Oil Cake Meal...	1.58 "	3.79 "
3 lbs.	Raw Rock Phosphate.....	---	---
<u>3 lbs.</u>	<u>Salt.....</u>	<u>---</u>	<u>---</u>
246 lbs.	Mixture.....	26.57 lbs.	174.17 lbs.
100 lbs.	"	10.80 "	70.80 "

Both lots of cows in each test were placed in small pastures, 35 x 300 feet in which the roughages were fed in racks. Many of the coarser branches of the pigeon pea tops were not consumed but these as well as unconsumed alfalfa was weighed back and the weights reported later are for roughages actually consumed.

All the cows received the same mixture of grain and beet pulp, and while the quantities fed to different cows varied depending on their production, the average of the grain fed each individual cow during the first and last period was the same as that fed the middle period. Since in these experiments we were trying to determine the value of roughages it was obviously necessary not to vary the quality or quantity of the concentrates.

Concentrate Food Mixture Used

<u>Ingredients</u>		<u>Protein</u>		<u>Moisture</u>	
75 lbs.	Boiled Barley.....	6.75 lbs.		59.55 lbs.	
50 lbs.	Corn Meal.....	3.75 "		45.85 "	
100 lbs.	Wheat Bran.....	15.50 "		60.90 "	
10 lbs.	Coconut Oil Cake Meal... 1.99 "			7.08 "	
5 lbs.	Linseed Oil Cake Meal... 1.99 "			3.79 "	
3 lbs.	New Rock Phosphate.....	---		---	
3 lbs.	Salt.....	---		---	
250 lbs.	Mixture.....	56.57 lbs.		174.17 lbs.	
100 lbs.	"	16.80 "		70.80 "	

Average Feed Prices Prevailing During Period of Experiments

	<u>First test</u> <u>Per Ton</u>	<u>Second test</u> <u>Per Ton</u>
Corn Meal.....	\$39.00	\$29.00
Wheat Bran.....	28.00	22.00
Rolled Barley.....	33.00	22.00
Coconut Oil Cake Meal.....	35.00	30.00
Linseed Oil Cake Meal.....	46.00	35.00
Raw Rock Phosphate.....	33.00	31.00
Salt.....	17.00	14.00
Beet Pulp.....	27.00	26.00
Pigeon Pea Tops, Pods attached (assumed).....	10.00	10.00
Green Alfalfa (assumed).....	10.00	10.00
Prices per ton mixture shown above	32.04	24.04

Average Daily Nutrients Consumed by Each Cow

First Experiment

<u>Cows on Pigeon Pea Tops</u>	<u>Digestible</u>	
	<u>Protein</u>	<u>Total Nutrient</u>
13.23 lbs. Grain Mixture	1.43 lbs.	9.37 lbs.
57.00 lbs. Pigeon Pea Tops, with pods	3.08 "	10.89 "
<u>2.00 lbs. Beet Pulp</u>	<u>.09 "</u>	<u>1.43 "</u>
72.23 lbs.	4.60 lbs.	21.69 lbs.

Cows on Green Alfalfa

13.14 lbs. Grain Mixture	1.42 lbs.	9.30 lbs.
69.30 lbs. Green Alfalfa	3.24 "	10.01 "
<u>2.00 lbs. Beet Pulp</u>	<u>.09 "</u>	<u>1.43 "</u>
84.44 lbs.	4.75 lbs.	20.74 lbs.

STATE OF NEW YORK

IN SENATE

January 1, 1900

REPORT OF THE

COMMISSIONER OF THE LAND OFFICE

IN RESPONSE TO A RESOLUTION PASSED BY THE SENATE

APRIL 1, 1899

ALBANY: J. B. LEECH, STATE PRINTER, 1900.

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Average Daily Nutrients Consumed by Each Cow

Second Experiment

<u>Cows on Pigeon Pea Tops</u>	<u>Digestible</u>	
	<u>Protein</u>	<u>Total Nutrients</u>
11.4 lbs. Grain Mixture	1.23 lbs.	8.07 lbs.
36.0 " Pigeon Pea Tops with pods	1.94 "	6.88 "
<u>2.0 " Beet Pulp</u>	<u>.09 "</u>	<u>1.43 "</u>
49.4 lbs.	3.26 lbs.	16.38 lbs.

Cows on Green Alfalfa

11.4 lbs. Grain Mixture	1.23 lbs.	8.07 lbs.
55.0 " Green Alfalfa	2.58 "	7.97 "
<u>2.0 " Beet Pulp</u>	<u>.09 "</u>	<u>1.43 "</u>
68.4 lbs.	3.90 lbs.	17.47 lbs.

Weights of Cows

The cows were weighed once each week. In experiment I the average weight of all cows when fed pigeon peas was 885 lbs; when fed alfalfa 860 lbs. - an average difference of 25 lbs. in favor of the pigeon peas.

In experiment II the average weight was 1004 lbs. on the pigeon peas and 990 lbs. on alfalfa, - an average difference of 14 lbs. in favor of the pigeon peas.

Butter Fat Tests

Composite sample of four consecutive milkings of each cow each week were tested for butter fat content.

In experiment I the cows averaged 4.26% fat when fed pigeon peas and 4.01% when fed alfalfa.

In experiment II the average test was 4.08% on pigeon peas and 3.98% on green alfalfa.

Thus in each experiment the test was slightly higher when the pigeon peas were fed.

Milk Production, Feed Consumption and Costs

The more important details of production, quantity of feed fed daily, costs, etc., are shown in the following condensed table.

	Experiment I		Experiment II		Both Experiments	
	With	With	With	With	With	With
	PP	A	PP	A	PP	A
Average lbs. milk per cow per day	28.6	29.3	27.4	27.8	28.0	28.5
Average percent butter fat	4.26	4.01	4.08	3.98	4.17	3.99
Average weight, lbs.	885.0	860.0	1004.0	990.0	944.5	925.0
Average lbs. concentrate fed per cow per day	15.2	15.1	13.4	13.4	14.3	14.2
Average roughage consumed per cow per day	57.	69.	36.	55.	46.5	62.0
Feed cost per 100 lbs. of milk produced*	\$1.83	\$1.99	\$1.26	\$1.58	\$1.54	\$1.78
Lbs. milk produced per lb. concentrate fed	1.88	1.93	2.05	2.07	1.96	2.00
Pounds roughage consumed per lb. of milk	1.99	2.37	1.34	1.97	1.67	2.17

PP = Pigeon Pea

A = Alfalfa

* When both green pigeon pea tops and green alfalfa were assumed to cost \$10.00 per ton.

Summary and Conclusions

(1) In both experiments the cows produced slightly more milk when fed green alfalfa. This difference, however, is so small that it probably has no significance.

(2) In both experiments the per cent fat in the milk was slightly higher when the cows were fed pigeon peas.

(3) In both experiments the average weight of the cows was slightly higher when they were fed pigeon peas.

(4) The quantity of concentrates fed to each cow was the same when pigeon peas or alfalfa were fed, hence any differences in yield, test or weight should have been due to the roughages.

(5) In both experiments the cows consumed materially more of the green alfalfa than of the green pigeon pea tops, the average consumption per cow for both experiments being 46.5 lbs. of the pigeon peas and 62. lbs. of the green alfalfa. From this it may be assumed that green alfalfa is more palatable but that green pigeon pea tops (with some attached immature pods) are more nutritious.

(6) The cows consumed materially less of both roughages during the second experiment, the average being 63.0 lbs. during the first and 45.5 lbs. during the second experiment. The rainfall during the first experiment was more than double that of the second and this probably resulted in more lush roughages during the first period, in addition to the likelihood that there was more surface water clinging to the plants in the wetter period resulting in heavier weights. Had dry matter determinations of the roughages been made daily they might have explained the differences in consumption noted above. It is also not unlikely that 45 lbs. of green pigeon pea tops may contain as much dry matter as 63 lbs. of green alfalfa.

(7) With the same quantity of concentrates fed to both lots in each experiment it can be calculated that based on milk production and roughage consumption, a given quantity of green alfalfa proved to be worth only 84 per cent as much in the first and 68 per cent as much in the second experiment as was an equal quantity of the green pigeon pea tops with some attached pods.

(8) There was no objectionable taste in the milk of the pigeon pea or alfalfa fed cows. However, out of 13 people tasting various samples of milk, the origin of which was unknown to them, many expressed a preference for milk from cows which had been fed on mixed roughages.

(9) In general, the results of these experiments confirm the earlier work by Dr. Krauss; - that pigeon pea roughage is excellent for dairy cattle. No doubt the practicable and economical way of feeding pigeon pea roughage would be to pasture the pigeon pea field rather than to bring the roughage to the cows as was necessary in this case.

(7) With the same quantity of concentrate fed the milk in each experiment it can be estimated that based on milk production and roughage consumption, a given quantity of green alfalfa proved to be worth only 54 per cent as much in the first and 64 per cent as much in the second experiment as was an equal quantity of the green alfalfa plus hay with some attached pods.

(8) There was no objectionable taste in the milk of the pigs on hay or alfalfa fed cows. However, out of 15 people tasting various samples of milk the origin of which was unknown to them, many expressed a preference for milk from cows which had been fed on mixed roughage.

(9) In general, the results of these experiments confirm the earlier work by Dr. Kirsch - that pigon hay roughage is excellent for dairy cattle. No doubt a practical and economical way of feeding pigon hay roughage would be to combine the pigon hay field rather than to bring the roughage to the door as was necessary in this case.